CHAPTER 7. OBJECTIVES, PRINCIPLES AND CONSIDERATIONS, AND MEASURES

GENERAL PLANNING OBJECTIVES

The Comprehensive Study has established three general planning objectives:

- **Improve flood risk management throughout the systems.**
- **Integrate protection and restoration of ecosystem into the flood damage reduction measures.**
- **Resolve policy issues and address limiting institutional procedures.**

From these general objectives, more specific planning objectives were established.

OBJECTIVES TO IMPROVE FLOOD RISK MANAGEMENT THROUGHOUT THE SYSTEMS

Although the Sacramento and San Joaquin River systems have significant physical differences, the flood management systems of both watersheds depend upon a similar combination of local, State, and Federal entities and facilities to function properly. Managers of these entities and structures also face the challenges of adapting their flood management systems to future flood threats while accommodating their systems to changing public priorities. These objectives are:

- ***Identify existing flood protection levels for the various parts of the system; determine the associated flood risk and the engineering, economic, and environmental feasibility of maintaining or improving the reliability of existing protection or providing additional protection; and propose revised flood protection levels where needed.***
- ***Avoid or reduce potential future flood damage by communicating information about the residual flood risk throughout the system.***
- ***Improve reliability, conveyance capacity, and use of reservoir storage space of the existing system to reduce the risk to lives and property.***
- ***Minimize flood management system operation and maintenance requirements and associated costs.***
- ***Improve system-wide implementation and coordination of floodplain management activities among local, State, and Federal entities.***

OBJECTIVES TO INTEGRATE PROTECTION AND RESTORATION OF ECOSYSTEMS INTO FLOOD DAMAGE REDUCTION MEASURES

Local, State, and Federal entities face the challenges of adapting their flood management systems to future flood threats and the challenges of accommodating these systems to restore ecological resources within the basins. Specific planning objectives to integrate protection and restoration of ecosystems into flood damage reduction measures include:

- ***Promote natural, dynamic hydrologic and geomorphic processes in the flood management system***.

- ***Increase and improve riparian, floodplain, flood basin, and riverine habitat throughout the flood management system area***.

- ***Promote recovery of threatened and endangered species and the stability of native species populations in the flood management system area***.

- ***Preserve agricultural productivity while promoting the ecological value of agricultural land***.

OBJECTIVES TO RESOLVE POLICY ISSUES AND ADDRESS LIMITING INSTITUTIONAL ISSUES

Institutional changes are needed to prevent crisis management during future floods. Suggestions include:

- ***Develop tools to analyze the hydrologic, hydraulic, geomorphic, and biologic processes of the flood management system***.

A more detailed technical database and computer modeling are needed for each basin. Detailed resource mapping of the flood management system area is needed to provide data to analyze the system's status and deficiencies. The Comprehensive Study must develop procedures to disseminate and maintain these data and to enhance analytical capabilities.

- ***Improve flood damage reduction management, and streamline procedures to obtain permits, so as to minimize and resolve conflicts***.

Respect and recognition of the missions, laws, regulations, and priorities of other agencies, non-governmental groups, businesses, and individuals are key to efficient management of floods, ecosystem restoration, and public awareness of State and Federal efforts to balance public priorities.

- ***Develop a process which will identify solutions that do not have significant environmental impacts; will promote likely acceptability by all concerned; and can be implemented in a timely manner***.

Regulatory permit problems can be time-consuming and costly. NEPA/CEQA requirements are equally complicated. Cooperation among all involved parties will smooth the path to stable, durable measures that can be adopted and implemented. While the Federal and State planning processes allow for developing measures that avoid significant impacts, it is difficult to merge environmental restoration with flood management within current institutional frameworks.

- ***Develop a process for flood management system damage recovery that identifies short-term measures that will protect flooded or damaged areas from further damage, but will allow serious consideration of short-term and longer-term actions that will integrate floodplain and ecosystem restoration.***

During emergency repair conditions, time is of the essence. Evaluation of all repair options can not even be considered. A procedure is necessary that will allow a short-term emergency repair that does not preclude future options. These other options may provide additional benefits of ecosystem restoration, decrease long-term flood management system maintenance costs, and increase overall effectiveness.

GENERAL PLANNING PRINCIPLES AND CONSIDERATIONS

GENERAL PLANNING PRINCIPLES

The Comprehensive Study emphasizes the following principles when considering measures to resolve problems in flood damage reduction and ecosystem restoration:

- ***Make significant progress toward reducing flood damages and promoting ecosystem restoration in the watershed***.

The computer modeling of flood management and ecosystem restoration measures during this study must recognize and evaluate linkages between flood damage reduction and ecosystem restoration.

- ***Measures must be commonly acceptable, legally feasible, and implementable.***

The Study will focus first on measures that recognize both flood damage reduction and ecosystem restoration. Proposals will aim at support and consensus among stakeholders, and complement other river and watershed programs in California.

Enduring, cost-effective physical structures require suitable design, materials, construction, and maintenance. To an equally important degree, sound, prudent principles must be applied to plan formulation, evaluation, and selection processes in this study. Considering and incorporating the interests of multiple, diverse stakeholders to reach consensus will ensure design of durable, implementable measures.

GENERAL PLANNING CONSIDERATIONS

Participants in this study have acknowledged the political, economic, environmental, and public factors that historically restrict, but must be considered in, the planning, operation, and maintenance of a flood management system. These considerations include the following:

- ***Plans should be designed so not to reduce the level of flood damage protection without compensation***.

Changes or extensions of the flood management system facilities or changes in land use usually trigger hydraulic and hydrological changes in upstream and downstream geographic areas. There are no consistent Federal, State, or local standards to identify and evaluate the significance and geographic extent of hydraulic and hydrological impacts, or ways to mitigate for any impacts. Measures such as improving levees may cause hydraulic impacts to upstream and downstream areas, and the hydraulic mitigation cost could increase costs so significantly that projects become infeasible. Projects that would create significant unmitigated hydraulic impacts would not be acceptable and would not be proposed.

- ***Nonstructural alternatives that require land acquisition should focus on willing sellers***.

Respect for local private property rights is essential. Local property owners and other local interests should not become defensive and, in turn alienated, by the concept of nonstructural measures. Under these measures, local flood protection will increase, and some agricultural production will remain feasible and can be continued if the owner desires to do so, and if neighboring landowners will not be significantly affected. These benefits must be communicated clearly to the affected parties.

- ***Projects should strive to minimize land use impacts and compensate for unavoidable land use impacts***.

Coordination among local government entities and local interest is based on a respect for local economic activities and land use plans. Local economic activities support flood management system operation and maintenance activities directly through levee and drainage assessments, and indirectly through State taxes. Measures which affect economic and land use should be compensated for.

- ***Waterways and watersheds provide many beneficial uses - water supply, hydroelectric energy production, vegetation communities and wildlife habitat, and recreation***.

These resources are administered and maintained by various agencies and entities separate from study participants. To involve these parties, a comprehensive flood damage reduction plan must recognize that rivers and floodplains are not simply conveyance and storage facilities. Measures which affect water supply, energy production, and other resources should provide opportunities for multiple benefits and should compensate for impacts.

- ***Flood damage reduction measures that eliminate agricultural operations adjacent to waterways may sever riparian water rights***.

Respect for water rights and compensation for any impacts is vital to build cooperation with local interests.

- ***Local, State, and Federal government entities must prioritize competing demands for resources, and work to build public support and consensus for programs***.

Flood damage reduction efforts often compete with other programs for support. Once the dangers of a flood have passed, and the traumatic experiences of a flood become memories, public awareness of flood risk and flood safety grows dim. Non-flood years offer a false sense of security to potential flood victims. Apathy works against the best interests of these victims and of flood managers, until the crisis looms, in an increasingly predictable manner. Public awareness can only be strengthened by greater public involvement in the formulation of measures for flood damage reduction.

- ***Calculating the economic value of long-term environmental benefits is difficult***.

There are no definitive and widely supported Federal, State, or local standards to identify and evaluate environmental benefits. Consequently, economic evaluations of environmentally favorable measures may not fully account for all the benefits realized. The work being performed by DWR and the EPA with the California interagency Floodplain Management Coordination Group (see Glossary) in developing a framework for quantifying the benefits of maintaining floodplain functions is intended to resolve this issue.

- ***Environmental laws, regulations, and policies strongly favor nonstructural alternatives for flood damage reduction measures***.

For the most part, flood management systems have historically relied on structural measures. It will be a challenge to show that nonstructural alternatives are as feasible, safe, and practical as structural measures already in-place and tested. However, the growing awareness

that flood "control" is not always possible, and that flood "management" is the most realistic approach, solidifies a base from which to work toward consensus among public interests.

- ***Minimize socio-economic, land use, and environmental impacts associated with the flood management system and compensate for unavoidable socio-economic, land use, and environmental impacts***.

Government agencies and private interests recognize the importance of the flood management system to protect lives and property, but also recognize the need to balance flood damage reduction with other public priorities.

- ***Allow for flexibility to adapt the system's management to respond to future changes***.

The designers of the Sacramento River and San Joaquin River flood management systems focused on contemporary problems, information, and acceptable solutions to design the system, but system operators have been forced to adjust to post-design physical, economic, biological, and public changes. Although some future changes can be predicted for California, future operators of the flood management system must develop coordinated efforts between many local, State, and Federal entities to respond to future changes and uncertainties.

MEASURES

Phase I of the Comprehensive Study identified potential measures for flood damage reduction, and environmental restoration proposed throughout the Sacramento and San Joaquin River basins. These potential measures will be expanded during Phase II to develop the comprehensive Master Plans . A precise definition of terms is useful in discussing any strategy:

A measure is a feature or activity that can be implemented at a specific geographical site to address one or more planning objectives. A feature is an element that requires construction or acquisition, including, for example, dams, detention basins, levees (including setback levees), channel modifications, water control structures (e.g., weirs, pumps), bank protection (e.g., riprap revetment, biotechnical treatments, spur dikes), floodwalls, structure relocations, fences, other structural elements, and flood easements and lands for construction. An activity is an action or policy, including, for example, modifying reservoir releases and flood management diagrams, planting and irrigating, managing or not managing vegetation (cutting, herbicide application, burning, grazing), acquiring flood easements, restricting land use through zoning, and requiring flood insurance.

The possible measures for flood damage reduction and environmental restoration were collected from several sources. Consequently, these measures have been developed to various

levels of detail and evaluation. Sources of measures, initial screening process, general types, and proposed future use are described in the following sections.

SOURCES OF POTENTIAL MEASURES:

- Meetings of the Technical Support Groups;
- Meetings of the Local Support Groups;
- The 1997 California Governor's Flood Emergency Action Team (FEAT) Report;
- The California Resources Agency's San Joaquin River Management Plan,
- The Sacramento River Conservation Area Handbook developed under the SB1086 program,
- Interview records of flood-management and resource-management agency personnel and other concerned organizations (interviews conducted in 1994 for the Sacramento River Bank Protection Project);
- Various management plans for the river basins;
- Plans developed by the Bureau of Reclamation to implement the CVPIA; and
- Plans developed by CALFED.

Other review sources were the Corps' Small Communities Flood Assessments (Area-Wide Assessment Study, Sacramento River Basin; and Sacramento River Basin, Arboga and Feather River, Yuba County); DFG 1993 report, "Restoring Central Valley Streams: A Plan for Action;" the State Lands Commission 1993 report, "California's Rivers: A Public Trust Report;" DWR 1998 State Water Plan Update; and other reports by Federal and State government agencies, by local agencies such as SAFCA and the Lower San Joaquin Levee District, and by non-profit organizations such as The Nature Conservancy. In many cases reports identify and recommend specific projects and associated measures. While the Comprehensive Study may not incorporate these measures completely, the Study has identified those measures which accomplish the flood damage reduction objectives of the Study and will combine these measures with ecosystem restoration measures to accomplish multiple objectives. The FEAT Report and its recommendations for specific projects is a specific example of this approach.

Measures from these sources range from general concepts of potential applicability at many locations throughout the river basins, to specific projects at specific locations. The general measures will require site-specific development in Phase II of the Comprehensive Study.

INITIAL SCREENING OF POTENTIAL MEASURES

There was much overlap and duplication of potential measures from the original sources. The study team screened the material to develop a set of unique measures.

Measures identified from CALFED's Ecosystem Restoration Program Plan (ERPP) represented the most sizeable database (approximately 700 measures). This database is nearly twice as large as the one derived from all other sources combined. The CALFED ERPP "actions" appeared in the draft CALFED Bay-Delta Program, released in 1997. These measures were also screened to eliminate those outside of the Comprehensive Study area.

Some measures were located at numerous sites throughout the basins. This type of measure was combined into a set of single system-wide measures for application throughout the basins.

Several other considerations affected whether or not a suggested action was included as a potential measure for this study:

- Measures must be aimed at the problem area, which includes the channels and associated floodplains of the mainstems of the Sacramento and San Joaquin rivers and major tributaries upstream to the dams or urban area and other tributaries that offer opportunities for flood-damage reduction and ecosystem restoration;

- Measures should have combined elements of flood-damage-reduction and ecosystem restoration. Single-objective measures were included, however, where such measures can be developed, or combined with other measures, to address both areas of concern.

- Measures need not be within the Corps' or The Reclamation Board's current authorities to fund, design, or construct.

TYPES OF MEASURES AND USE OF MEASURES

Categories, or types of measures, were developed from a review of all measures. The measure types were further defined in meetings with the Local Support Groups and the Executive Committee. Basically, there are two measure types - one for flood damage reduction and one for ecosystem restoration. They are not always mutually exclusive. Many measures have the potential to help meet both goals. Ideally, this dual-purpose type of measure is the goal of the Master Plans developed during Phase II. For the purpose of this phase of the study, however, each measure was typified by its primary purpose or major output, aside from its combined potential.

The flood damage reduction measures were categorized by which of the primary physical or operational elements of the flood management systems would be affected. These elements are: the flood flow regime (the shape, frequency, duration, timing, and magnitude of the flood hydrographs); capacity of the system (flow discharge that can be contained within the system); reliability of the system (to safely meet the design capacity); and management of activities in the areas subject to flooding (floodplain management). Table 7-1 lists the flood damage reduction measure types.

TABLE 7-1
TYPES OF FLOOD DAMAGE REDUCTION MEASURES

Physical or Operational Element of Flood Management System Affected	Measure Types
Flood Flow Regime	• Create or modify existing reservoir storage and/or releases • Create or modify transient storage in flood basins • Modify existing water control plans • Other
System Capacity	• Backup levee • Setback levee • Reconstruct channel • Raise levee • Improve or create bypass system • Create meanderbelt • Manage vegetation/substrate within existing floodway • Other
System Reliability	• Protect streambank • Strengthen, raise, or repair levee • Other
Management of the Floodplain	• Modify existing buildings to reduce future damage • Discourage future development in floodplains • Redirect incompatible development out of floodway/floodplain • Require flood insurance

Specific examples of types of flood damage reduction measure include operating/re-operating reservoirs system wide (Flood Flow Regime); setback levees (System Capacity), strengthening levees (System Reliability); and revising floodplain management policy by expanding flood insurance (Management of the Floodplain). Definitions of specific examples of the types of these measures are provided in Appendix K.

The types of ecosystem restoration measures are listed in Table 7-2. Definitions of specific examples of the types of these measures appear in Appendix K.

TABLE 7-2
TYPES OF ECOSYSTEM RESTORATION MEASURES

- Reforest Floodplain Corridors
- Protect Existing Natural Physical Processes
- Re-establish Suitable Hydrologic Regime to Restore Natural Physical Processes
  -Set back levees
  -Revise schedule of flow releases
- Remove Bank Protection to Restore Natural Processes
- Allow Riparian Forest to Reach Maturity
- Restore Oxbows -- grade and plant abandoned oxbows
- Hardpoint Bank Protection -- protect pumps, diversions, etc. locally (e.g., with mini spur-dikes) rather
  than continuous revetment
- Restore and Reforest High Terraces and Berms
- Raise Bypass Levees to Allow Habitat Development
- Raise Mainstem Levees to Allow Habitat Development
- Allow Habitat Development within Off-Stream Storage Areas
- Create Habitat Node(s)

A database format is being used to compile the measures and to aid in the geographic scope of the Comprehensive Study. The sorting mechanism is by various parameters of interest. The base can be expanded with new potential measures.